Toward the Environmental Design of Library Buildings

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Introduction

SINCE THE BEGINNING of the modern library era, librarians and other library planners have been concerned with developing better library facilities. Through the years many architectural solutions to problems of storage, location, and service have been proposed, utilized, changed, and discarded.

During the past several decades an interdisciplinary approach to the study of humans and their built environment has been developing. This inquiry seeks to investigate the often subtle and complex relationships that exist between people and buildings...those environments where we spend the great majority of our lives. Information regarding these relationships is beginning to emerge from a number of branches of the social and physical sciences. Further, this information is beginning to be applied to the process of building planning.

Environmental design is the aspect of architecture and building planning concerned with the proper planning and design of built environments to accommodate the social, physical, psychological, and behavioral needs of people. Findings and methodologies from environmental design can be applied to library planning to contribute to the continuing process of providing better library environments.

This article will provide an overview of environmental design in an attempt to provide conceptual and exemplary information pertinent to

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library building planning. The intent here is to furnish an awareness of the possibilities for and the implications of applying the concepts of environmental design to library buildings.

> At the very least, the designer will acquaint himself with the current thought in the human sciences that applies to the man-environment equation....With even a limited background, a designer at least acquires the capability of questioning some of his easy assumptions about the purpose his design is intended to serve. Indeed, if he can't make this basic breakthrough in his own mental system, more elaborate processes won't help him anyway.[1]

Libraries exist to provide free access to information and to support lifelong learning. The fulfillment of these purposes rests primarily upon usage which provides that interface between materials and people. With very few exceptions, the more libraries are used the more they fulfill their missions.

Information from environmental design can be used to make libraries more useful and functional. This is accomplished by making library environments more "human oriented," allowing people the opportunity to avoid many stressful situations and permitting both users and staff the opportunity to be as effective as possible in whatever activities they choose to pursue within the library building. Although much has been made of the adaptability of humans to less than ideal situations, this adaptation requires energy that could be more profitably utilized in other ways.

Environmental Design

As used here, "the term environmental design has come to connote a technical commitment to the evolution of the environment as an integral aspect of human biological and non-biological systems." The objective is to accommodate these two systems "through the appropriate organization of relevant variables in the designed environment."[2] Environmental design, then, is that discipline which seeks to manipulate those variables through proper planning to create the built environment sensitive to human needs.

Environmental design is the planning profession's response to the growing concerns of the environment and its interrelationship with human behavior and the quality of life. It has been described "as an art larger than architecture, more comprehensive than planning, more sensitive than engineering."[3] It is based upon two fundamental and interrelated ideas.

1. The designed environment affects human experience in direct and important ways. It does not *determine* experience, yet in combination with social influences, designed environments can support satisfaction, happiness, and effectiveness.
2. Despite their potential, designed environments often do not "work" with respect to their impact on human experience. They are awkward, even destructive, rather than being supportive of personal competence and growth.[4]

As it has developed, environmental design has begun to utilize the output of two closely allied fields of study—environmental psychology and human factor engineering. These disciplines, having emerged from widely disparate sources, have begun to be focused in a stereoscopic effect upon man and his built environment. Environmental psychology deals primarily with perception and behavior while human factors engineering concentrates upon performance. Together they form a more complete picture than either could separately.

Environmental Psychology

Until recently the built environment has been a relatively neglected factor in the study of human psychology. During the 1960s psychologists began to investigate the many facets of the relationship between the environment and human behavior.[5]

> Environmental psychology is a relatively new field of scientific inquiry which is concerned with the interrelationships between man's physical environment—particulary the built environment—and human experience....What distinguishes this field from others concerned with man's environment in relation to human behavior and experience, is its focus on the natural, on-going physical settings that define and guide human interaction. It is problem oriented, interdisciplinary in its conceptual and theoretical orientations, and eclectic in its methodological approaches....What must be noted is that its interdisciplinary emphasis is rooted in its need to have a close working relationship not only with environmental sociologists and anthropologists, but with designers, architects, planners, and other practitioners responsible for designing man's built environment.[6]

The developments in this field are evidenced by the number of major publications issued in recent years. The proliferation of specialized journals also is an indication of the expansion of environmental psychology. Among them are: *Environment and Behavior, Human Ecology, Psychology and Nonverbal Behavior.* In addition, The Associ-

ation for the Study of Man-Environment Systems and the Environmental Design Research Association, the principal organizations in this field, are quite active in terms of publications and meetings.

Within environmental psychology there are a number of topical areas that point out the variety of aspects within it. Human spatial behavior is one of these areas and this aspect is discussed in terms of privacy, personal space, and territoriality.[7]

Privacy

The concept of privacy, as it relates to environmental psychology, does not refer to being alone or to completely shutting oneself off from others. Instead, it is understood as the "control of others' access to oneself."[8] It is the "control" aspect that is important and not a self-imposed isolation. "Privacy can be defined as an individual's freedom to choose what he will communicate about himself and to whom he will communicate it in a given circumstance."[9]

A.F. Westin, in his book *Privacy and Freedom*, suggests four states of privacy: solitude, intimacy, anonymity, and reserve.[10] Each refers to a particular degree of privacy depending upon the amount and type of information about oneself that one is willing to share with others. For a number of writers this concept forms the "basis of most human spatial behavior."[11]

> To translate this viewpoint into practical environmental designs is not easy. However, a general principle is that we should attempt to design *responsive environments*, which permit easy alteration between a state of separateness and a state of togetherness. If privacy has a shifting dialectic quality, then, ideally, we should offer people environments that can be responsive to their desires for contact or absence of contact with others.[12]

Because privacy involves the control of access to oneself by others, it has implications for library designs. In public areas this means providing different types of seating and study areas so that individuals may make choices depending upon their needs and desires at the time.

> It is futile and economically wasteful to search for the "ideal reading area" with the hope that this will satisfy all patrons. There is no single reading station...that will satisfy the needs of everyone. The only feasible solution is to provide a variety of reading spaces that differ in important respects and let users discover the area most suitable for them personally.[13]

As related to library staff, privacy can become an important consideration especially in open office plan situations. Such furniture may either support the sought-after level of privacy, or it may prove to be a source of stress if the layout impedes privacy-seeking behavior.

It has been observed that pursuit of an adequate level of privacy includes freedom from unwanted eye contact.[14] This apparently involves intrusion into one's personal space, thus requiring a response. The reaction might result in conversation, or it might take the form of some defensive behavior. Either of these would take time and energy away from the task at hand.

Unwanted eye contact has been noted to increase discomfort and stress since eye contact demands acknowledging the presence of the other person.[15] Aaron Cohen and Elaine Cohen suggest that it is, in part, the need for visual privacy that led to the open office plan. The partitions reduced the lines of sight and helped eliminate unwanted eye contact. These authors also propose that patrons select reading room seats, partly to avoid unwanted eye contact.[16] It follows that care should be taken in the layout and furniture selection in order to support people's natural tendency to minimize unwanted eye contact.

Proxemics and Personal Space

Among the mechanisms that are used to regulate privacy are the two closely linked concepts of proxemics and personal space. Proxemics, a term formulated by anthropologist Edward Hall, is concerned with the "interrelated observations and theories of man's use of space as a specialized elaboration of culture."[17] Derived in part from the studies of animal behavior regarding territoriality, proxemics deals primarily with the ways that people space themselves in different social situations. In his book *The Hidden Dimension,* Hall describes four culturally defined distances used by Americans. Each distance has a close and far proximity phase.

Intimate Zone:

Close phase—touching
Far phase—6 inches to 18 inches

Personal Zone:

Close phase—1 1/2 feet to 2 1/4 feet
Far phase—2 1/2 feet to 4 feet

Social Zone:

Close phase—4 feet to 7 feet
Far phase—7 feet to 12 feet

Public Zone:

Close phase—12 feet to 25 feet
Far phase—Beyond 25 feet[18]

Each zone carries with it certain social and behavioral implications. Violation of these, particularly the closer ones, can result in various types of offensive and defensive behavior. This is demonstrated by the "cocooning" effect, or temporary withdrawal induced on crowded subways and elevators where people are forced into the intimate zone in inappropriate situations.[19] It is obvious that proxemics has implications for interior planning, but as Hall has pointed out, "it can never tell the designer how to design, only some of the things he should consider."[20]

Personal space extends proxemics to include the study of human-spatial behavior involving not only distance but "angle of orientation."[21] Robert Sommer, whose name is most closely linked with the concept of personal space, says it "refers to an area with invisible boundaries surrounding a person's body into which intruders may not come."[22]

Personal space is the basis for a large number of studies involving variables such as personal factors (age, sex, etc.), interpersonal factors (social relationships), and situational factors (particular types of places).[23] Settings for these studies have included hospitals, nursing homes, offices, and libraries.[24] Gülten Wagner summarized personal space studies in libraries in a recent ERIC document.[25]

Another aspect of proxemics and personal space is the area of "small group ecology."[26] This is the study of interaction of small groups in social and business settings and is important to library design. For instance, observational studies have noted that between 92 percent and 97 percent of all informal groups in public places consist of only two or three members.[27] This presents implications for the layout of public spaces in libraries. Even though conversations might be discouraged in most areas of the library, groups who come to the library together will want to sit together, whether at reading tables, study carrels, or in areas designed for casual seating. On the other hand: "There is hardly a point in having conversational areas for groups of eight or ten unless there is some sort of structured activity involved."[28]

This is because so few informal groups consist of more than three people.

Two terms are of note regarding personal space and small group ecology. Humphry Osmond, in evaluating psychiatric ward design, originated the terms *sociofugal* and *sociopetal.* The first term sociofugal refers to those aspects of design which tend to discourage social contact, and the second term sociopetal "is that quality which encourages, fosters, and even enforces the development of stable interpersonal relationships such as are found in face-to-face groups."[29] Furniture layout is a manifestation of these concepts. An extreme example would be two lounge chairs, first placed face to face and then back to back. The first would definitely encourage social interaction (sociopetal) while the second would discourage it (sociofugal). There are of course no positive or negative connotations inherent in these terms. In some situations—study areas for instance—sociofugal arrangements would support the normal quest for solitude. In other circumstances, benefit would be derived from social intercourse encouraged by sociopetal design.

Problems can arise when sociopetal arrangements of furniture are placed in areas where privacy is sought and/or intended. Conversely sociofugal layouts would be inappropriate and counterproductive in settings where conversation and interaction is intended.

One study indicated that arrangement of furniture in a one-to-one counseling situation can have a measurable effect upon the anxiety level of those being counseled. There was a significant reduction in anxiety where students were interviewed in an informal "knee-to-knee" arrangement as opposed to a more formal "across-the-desk" one.[30]

This is applicable to library environments as personal interviews and other counseling functions are conducted in the daily business of administering libraries. Further, this type of information would be applicable in the design of spaces and furniture intended for all interaction with the public. Reference interviews, learners advisory services, online searches, and other one-to-one situations could be more effective and productive if patron anxiety were reduced through more appropriate furniture arrangement.

It is here that the value to library design of proxemics and personal space can be seen. When a particular environment is planned, the expected behaviors can be taken into consideration and the types of arrangements may be properly chosen which support those behaviors. This is, of course, an oversimplification of the process, but it is provided to establish the concepts of human-spatial behavior within the processes of environmental design.

Territoriality

Territoriality, along with privacy and personal space, is also an interrelated component of environmental design important to library planning. The study of human territorial behavior owes much to the work of Konrad Lorenz and Robert Ardrey who have popularized the topic utilizing animal analogies.[31] However, this approach has been criticized by environmental psychologists who have pointed out the limitations of attempting to apply the elements of animal territoriality to human situations.[32]

Much of what is termed territorial behavior in human context concerns personalization and private property. Irwin Altman proposes the following definition:

> Territorial behavior is a self/other boundary-regulation mechanism that involves personalization of or marking of a place or object and communication that is "owned" by a person or group. Personalization and ownership are designed to regulate social interaction and to help satisfy various social and physical motives.[33]

It has been observed and theorized that an aspect of privacy and territoriality is personalization. A feeling of security is obtained when one's environment is marked or identified as his own. J. Douglas Porteous, in his book *Environment and Behavior*, says that "*Personalization* is necessary for the individual's self-identity...."[34]

Albert Mehrabian's concept of environmental psychology includes what he terms high and low load environments; those settings which are in themselves either stimulating or nonstimulating. He suggests that when certain monotonous tasks are performed, a high load environment might be required to counter the nonstimulating task. On the other hand, certain tasks which are high load, and are therefore stimulating, would require an environment which is not stimulating.[35] An employee's ability to personalize his work space would allow him to make some adjustment in the environmental load to accommodate the particular tasks he had to perform.

In addition to high and low load tasks, there is an aspect of personality that is important. Mehrabian discusses personality differences in terms of the ability to screen stimuli. This is "how much a person characteristically screens out the less relevant parts of his environment, thereby effectively reducing the environmental load and his arousal level."[36] A nonscreener would filter less of his environment and would therefore be affected by the stimuli by a greater degree than would a screener. Some people can tolerate noise and activity (high load) around

them as they work (screeners), while others must have quiet and solitude (low load) (nonscreeners). Screeners may in fact prefer a high load environment in order to achieve a balance with their immediate surroundings. Therefore, it follows that people be allowed to adjust their near environment to their own preferred levels of stimulation. Mehrabian suggests that in an office environment:

> Workers at all levels should be permitted to have and play desk radios, since these provide one of the few means available for manipulating arousal and pleasure levels within the office context. And of course employees should be permitted to personalize their work spaces as individual differences dictate: some might prefer or need a more (or less) loaded environment than others.[37]

This suggestion about radios may not, of course, be applicable to all library employees, but it serves to point out that "personalization" extends beyond visual items to other aspects of the immediate environment. "The quest for stimulating and attractive work places, the right to personalize one's own spaces and control temperature and illumination and noise are not academic issues to people who must spend eight hours a day in these settings."[38]

These concerns, of course, apply not only during the design and planning phases of a library but whenever administrative rules and regulations are formatted which govern the freedom employees have in adjusting their environment to meet their personal needs. These human tendencies are obviously of consideration in environmental design since they could help determine both how and how well a building functions.

Altman sums up the concerns of the foregoing concepts and their application to environmental design:

> What I speak of here is not only design for "task" or "resource" functions but design for *control over social interaction and stimulation*. If privacy and its associated mechanisms are ignored or rigidly incorporated into designs, or if the meaning of different levels of personal space and territory are not recognized, then people will have to struggle *against the environment* to achieve what they consider to be appropriate degrees of interaction. And, conflict, stress, and other costs are likely to the extent that people have to struggle with inappropriately designed environments. Thus the principle I am trying to state is that environmental design should take into account the dynamics of privacy as a changing process in which people open and close themselves to others, to different degrees, at different times, using personal space, territorial behavior, and other mechanisms to achieve a desired degree of privacy.[39]

Implications

There are many implications for library design and furniture layout arising from these interrelated aspects of environmental psychology. Some have become axiomatic such as in the area of public seating.

Robert Sommer observed a very high preference for corner seating at library reading tables. He attributed this to a quest for privacy and a securing of one's personal space.[40] The design recommendation stemming from this and other similar observations is to use four-seat rectangular tables. This will not only provide more of the preferred types of seats but will help ensure a more effective utilization of available floor space.

Round tables (four to six seats) tend to encourage conversation. It has been noted that the most effective angle of orientation for two people engaged in conversation is between zero degrees and ninety degrees.[41] Seating at round tables provides the angles that are most conducive to conversation. In areas of the library where socializing is discouraged, round tables may not be appropriate since they support interaction. However, in areas such as small group meeting rooms and staff areas, socialization is a desired activity and would be supported by the presence of round tables.

There are also implications for casual seating that have arisen from environmental design research. There are reasons why couches would not be desirable in library settings. First, for two people who wish to converse, a couch is not conducive to this activity. This is because it places the pair at a 180 degree angle, an angle that was found to inhibit affiliative behavior.[42] In addition, such a pair, sitting at each end of a typical six-foot couch, would be at the outside edge of Hall's "personal zone." This zone of one and one-half feet to four feet is generally reserved for close friendships and would exclude business related conversations. A two-seat couch would force the pair into the "intimate zone." This would produce a stressful situation except with couples where a "love seat" would be appropriate. This also helps explain why the center of a three-seat couch is rarely used.

An administrative reception area may also be better designed using information from proxemics and personal space research. Typically, a secretary may be required to serve also as a receptionist. Stress may result if this secretary is forced to converse with those waiting. However, adequate spacing can eliminate this problem.

As previously noted, an important aspect of proxemics is the distance for conversation. Hall observed that the social zone (four to twelve

feet) is the range in which almost all business and social discourse is conducted. Further, the far phase (seven to twelve feet) is usually the setting for more formal conversation.

> A proxemic feature of social distance (far phase) is that it can be used to insulate or screen people from each other. This distance makes it possible for them to continue to work in the presence of another person without appearing to be rude. Receptionists in offices are particularly vulnerable as most employers expect double duty: answering questions, being polite to callers, as well as typing. If the receptionist is less than ten feet from another person, even a stranger, she will be sufficiently involved to be virtually compelled to converse. If she has more space, however, she can work quite freely without having to talk.[43]

A distance of less than ten feet would constitute a sociopetal arrangement which encourages interaction. Beyond ten feet the arrangement would be more sociofugal, discouraging conversation. "Within certain distances, most people make an effort *not* to talk. Beyond certain other distances it is virtually impossible for them *to* talk."[44] In an atmosphere of a typical office reception area, conversations extending longer than a few minutes can become awkward and stressful. These particular strains may be reduced or eliminated by observing the proper distances when designing the arrangements of the furnishings. In addition to these examples, environmental psychology should continue to produce information of use to designers and planners which will assist in the development of structures that are more human oriented.

Ergonomics and Human Factors

"Human factors in built environments assume major importance if we are concerned with human efficiency, safety, comfort, morale and general usability associated with interior-design features of built facilities."[45] While environmental psychology deals with the built environment as it impacts the relations of people, ergonomics is concerned with the individual and his direct relationship with the physical aspects of the built environment. Originally called human factors engineering—or simply human factors—the term *ergonomics* has now been applied almost universally to this aspect of environmental design. Of late, ergonomics has even begun to pertain to elements previously regarded as social and psychological.[46] However, ergonomics is primarily concerned with the "continuing quest for an optimum relationship between people and the physical things that they have created and make use of...."[47]

There is hardly a component of the built environment that does not, in some way, have an impact upon the success of the individual. From the approach to the building, to the door, and throughout the space, the structure and its contents will either support the individual in his task or they will be an interference. Good ergonomic design will not, in itself, improve performance or productivity. It will, however, remove impediments. If a person is forced to expend time and energy in overcoming environmental stumbling blocks, then there is less time and energy available for the meaningful, productive work. "Since people come in a variety of shapes, size, and abilities—all of which are difficult if not impossible to change—the focus of ergonomics is on the design of products and environments that adapt to the *user* rather than vice versa."[48]

Although ergonomics has been applied most conspicuously to automated workstations, the implications for ergonomic considerations exist with all aspects of the built environment. The building can be viewed as being similar to the idea of a prosthetic device, supporting and extending the physical capabilities of those who would work there.[49] Wherever one contacts an element of the structure, there is an opportunity to apply ergonomic criteria to see that the interface is supportive. If the element supports the task, it is ergonomic; if it inhibits the task, then it is poorly designed.

If the theory of ergonomics is simple, the application is not quite so easy. Even a single environmental space contains a myriad of components each having a different impact upon each individual who uses that space. Additionally, different tasks performed by one individual in the same space may require different sets of ergonomic considerations.

> Since ergonomics is not the science of the readily available answer, each situation must be analyzed individually, using research at hand as a guideline and to provide a basis for comparing results. Many people contend that ergonomic offices are easy to design by following ready-made guidelines and standards. This is not entirely true, however.
>
> Guidelines can provide initial ideas, but they do have some shortcomings and should be used with caution. In some cases, ergonomics provides answers, while in others it offers only a method for deriving answers.[50]

Ergonomics must not only be concerned with the task to be performed, it must also take into account limitations and abilities of those being designed for. This is especially true in libraries where the span of age is as great as any public institution. Children who lack the height and strength of adults as well as older people who have lost the strength

of their prime must be considered. Providing barrier-free design for the handicapped is simply ergonomic design for people who are at the higher end of the physical limitation continuum.

In the past few years, "ergonomics" has become a buzzword of the office furniture industry.[51] It, along with the term *user friendly*, has been applied to anything that happened to be adjustable, whether it is truly ergonomic or not.[52]

In spite of all these obstacles to achieving an ergonomically correct environment, solutions to pieces of the problem are being proposed. These solutions take the form of new workstations, new hardware, new chairs, new lighting fixtures, etc. Only use will determine which of these solutions satisfy the requirements of ergonomics and which are merely design fads.

Conclusion

It may be argued that the considerations of environmental design are more properly within the realm of architects and interior designers. It is equally important that librarians and library building consultants be as knowledgeable. Environmental design information is most needed long before the architect is retained to design the library building. During the programming phase, this information will help provide the tools with which the library planners can make design choices. These decisions will involve, in part, the translating of the library's policies and goals into concrete terms that architects can deal with. Utilization of environmental design information by the library planners will help ensure that planning decisions specifically consider the needs of the humans who are to occupy those library spaces.

The library architect must rely upon the librarian-consultant for input regarding user behavior and activity. The more the library planner is able to utilize environmental design information the better able he/she will be to provide relevant information to the architect. Otherwise, the architect, working without sufficient direction, might make incorrect assumptions about library user behavior and activity, or worse, ignore such information, which would adversely affect the usefulness of the new structure.

The education of architects has begun expanding to include elements of environmental design.[53] Architects so trained will expect and require more detailed building programs which specify the proposed behaviors and activities of the users of the building. "Never forget that the program is addressed primarily to the architect. This program is

intended to be the means by which the desired library building in all its complexities is conveyed from the mind of the program writer to the architect."[54] The consultant or librarian who writes the building program should be aware of the implications of environmental design in order to provide as correct and unambiguous information as possible.

Information regarding environmental design will be of value to librarians and consultants in evaluating architects' plans. Library planners who can think in terms of human-building interactions will be able to more effectively evaluate a proposed library in terms of its impact upon users. By using environmental design information, many potential problems can be corrected before the final working drawings are made, when changes are much less expensive and when they are certainly more likely to be implemented.

Existing libraries may also benefit from environmental design information. Evaluations can be made of libraries to determine ways of improving their usefulness through renovation or rearrangement. By applying environmental design research techniques and methodologies, information about existing libraries can be gathered which would help improve those libraries' environments.

There has been and continues to be an active interest, on the part of the library community, in improving library buildings to enable them to better serve the functions for which these structures are intended. It is evident that the field of environmental design, along with its major components of environmental psychology and ergonomics, has application to library design and planning.

Much in the way of conceptual and theoretical—as well as factual—information is readily available. It would be of great value to librarians in understanding the importance of environmental design not only in terms of initial building planning, but also in terms of the many aspects of administering facilities to help ensure their most profitable utilization.

References

1. Deasy, C.M. *Design for Human Affairs*. Cambridge, Mass.: Schenkman, 1974, p. 74.

2. Studer, Raymond G., and Stea, David. "Architectural Programming, Environmental Design and Human Behavior." *Journal of Social Issues* 22(Jan. 1966):127.

3. Dober, Richard P. *Environmental Design*. New York: Van Nostrand, 1969, preface.

4. Friedman, Arnold, et al. *Environmental Design Evaluation*. New York: Plenum, 1978, p. 1.

5. Wohlwill, Joachim F. "The Emerging Discipline of Environmental Psychology." *American Psychologist* 25(April 1970):303-12.

6. Wolman, Benjamin B. *Dictionary of Behaviorial Science*. New York: Van Nostrand, 1973, p. 122.

7. Stokols, Daniel. "Environmental Psychology." *Annual Review of Psychology* 29(1978):270; and Altman, Irwin. *The Environment and Social Behavior: Privacy, Personal Space, Territory and Crowding*. Monterey, Calif.: Brooks/Cole, 1975.

8. Stokols, "Environmental Psychology," p. 270.

9. Ittelson, W.H., et al. *An Introduction to Environmental Psychology*. New York: Holt, Reinhart and Winston, 1974, p. 152.

10. Westin, Alan F. *Privacy and Freedom*. New York: Atheneum, 1967, pp. 31-32.

11. Canter, David, and Kenny, Cheryl. "The Spatial Environment." In *Environmental Interaction: Psychological Approaches to Our Physical Surroundings*, edited by David Canter and Peter Stringer, p. 140. New York: International Universities Press, 1975.

12. Altman, *The Environment and Social Behavior*, p. 207.

13. Sommer, Robert. "Reading Areas in College Libraries." *Library Quarterly* 38(July 1968):255-56.

14. ———. *Tight Spaces: Hard Architecture and How to Humanize It*. Englewood Cliffs, N.J.: Prentice-Hall, 1974, p. 106.

15. Coss, Richard G. "The Cut-off Hypothesis: Its Relevance to the Design of Public Places." *Man-Environment Systems* 3(Nov. 1973):417-40.

16. Cohen, Elaine, and Cohen, Aaron. *Planning the Electronic Office*. New York: McGraw-Hill, 1983, pp. 117-18.

17. Hall, Edward T. *The Hidden Dimension*. Garden City, N.Y.: Doubleday, 1966, p. 1.

18. Ibid., pp. 116-27.

19. Sommer, Robert. *Personal Space: The Behavioral Basis of Design*. Englewood Cliffs, N.J.: Prentice-Hall, 1969, p. 13.

20. Hall, Edward T. "Communication and Design." *Man-Environment Systems* 2(March 1972):112.

21. Altman, *The Environment and Social Behavior*, p. 208.

22. Sommer, *Personal Space*, p. 26.

23. Altman, Irwin, and Vinsel, Annie M. "Personal Space: An Analysis of E.T. Hall's Proxemic Framework." In *Human Behavior and Environment: Advances in Theory and Research*, vol. 2, edited by Irwin Altman and Joachim E. Wohlwill, pp. 192-93. New York: Plenum, 1977.

24. Evans, Gary W., and Howard, Roger B. "Personal Space." *Psychological Bulletin* 80(Oct. 1973):334-44.

25. Wagner, Gülten. *Use of Personal Space in Libraries: A Review*. 1983 (ERIC ED 267 806).

26. Sommer, *Personal Space*, pp. 58-73.

27. James, John. "A Preliminary Study of the Size Determinant in Small Group Interaction." *American Sociological Review* 16(Aug. 1951):476; and Bakeman, Roger, and Beck, Stephen. "The Size of Informal Groups in Public." *Man-Envrionment Systems* 3(Jan. 1973):51.

28. Sommer, *Personal Space*, p. 60.

29. Osmond, Humphry. "Function As The Basis Of Psychiatric Ward Design." In *Environmental Psychology: Man and His Physical Setting*, edited by Harold M. Proshansky, et al., p. 567. New York: Holt, Reinhart, and Winston, 1970.

30. Myers, Robert Kinsley. "Some Effects of Seating Arrangements in Counseling." Ph.D. diss., University of Florida, 1969, p. 44.

31. Lorenz, Konrad. *On Aggression*. New York: Harcourt, 1966; and Ardrey, Robert. *The Territorial Imperative: A Personal Inquiry into the Animal Origins of Property and Nations*. New York: Atheneum, 1966.

32. Porteous, J. Douglas. *Environment and Behavior: Planning and Everyday Urban Life*. Reading, Mass.: Addison-Wesley, 1977, pp. 21-22.

33. Altman, *The Environment and Social Behavior*, p. 107.

34. Porteous, *Environment and Behavior*, p. 25.

35. Mehrabian, Albert. *Public Places and Private Spaces: The Psychology of Work, Play, and Living Environments*. New York: Basic Books, 1976.

36. Ibid., p. 24.

37. Ibid., p. 145.

38. Sommer, *Tight Spaces*, p. 113.

39. Altman, *The Environment and Social Behavior*, p. 211.

40. Sommer, *Personal Space*, pp. 39-57.

41. Mehrabian, Albert, and Diamond, Shirley G. "Effects of Furniture Arrangement, Props and Personality on Social Interaction." *Journal of Personality and Social Psychology* 20(Oct. 1971):21.

42. Ibid.

43. Hall, *The Hidden Dimension*, pp. 115-16.

44. _____, "Communication and Design," p. 109.

45. Burgess, John H. *Human Factors in Built Environments*. Newtonville, Mass.: Environmental Design & Research Center, 1981, p. 48.

46. Koffler, Richard P. "Using Ergonomic Logic in Designing Offices." *The Office* 104(Oct. 1986):15; and Kaplan, Archie. "The Ergonomics of Office Automation." *Modern Office Procedures* 27(May 1982):53.

47. Presnick, Walter J. "Reports from the Ergonomic Frontiers: U.S. Moves Faster." *Office Administration and Automation* 44(Oct. 1983):40.

48. Springer, T.J. "Ergonomics: The Real Issues." *Office Administration and Automation* 45(May 1984):69.

49. Deasy, *Design for Human Affairs*, p. 67.

50. Koffler, "Using Ergonomic Logic in Designing Offices," p. 18.

51. Post, Charles. "The Outlook for Office Chairs." *Office Administration and Automation* 44(Oct. 1983):42.

52. Springer, "Ergonomics: The Real Issues," p. 69.

53. Geddes, Robert L., and Spring, Bernard P. *A Study of Education for Environmental Design* (a report by Princeton University for the American Institute of Architects). Princeton, N.J.: Princeton University Press, 1969 (ERIC ED 104 659).

54. Holt, Raymond M. *Wisconsin Library Building Project Handbook* (Bulletin No. 8268). Madison: Wisconsin Division for Library Services, Wisconsin Dept. of Public Instruction, 1978, p. 69.